704 REINFORCING STEEL

704.01 DESCRIPTION

This work shall consist of furnishing and placing uncoated or epoxy coated reinforcing steel.

704.02 MATERIALS

Reinforcing steel shall meet the requirements of 812.02 or 812.03. The use of only one grade of steel will be allowed for bar reinforcement unless otherwise permitted in writing by the Engineer. All mill tests for reinforcing steel shall be certified for each heat of steel not only as to test results but also to physical and chemical requirements of these specifications. Extra bars shall be furnished for field sampling and tests. A sample is required for each 25 tons or fraction thereof for each size of bar used. Samples shall be cut from the steel after delivery, as directed by the Engineer.

704.03 SHOP DRAWINGS

Shop drawings, including placement drawings and bending diagrams, shall be submitted in accordance with 105.02. No materials shall be ordered until such drawings are approved. Bar lists, including weights, shall be submitted to the Engineer.

704.04 FABRICATION

Bent-bar reinforcement shall be cold bent to the shapes shown on the plans, and unless otherwise provided on the plans or by authorization of the Engineer, the bends shall be made in accordance with the following requirements:

Hooks and stirrups shall be bent using dimensions and diameters defined by "ACI Standard Hooks" in the Manual of Standard Practice or CRSI.

Bars partially embedded in concrete shall not be bent except as shown on the plans or as approved by the Engineer.

Bar reinforcement shall be shipped in bundles, tagged and marked in accordance with the Code of Standard Practice of the Concrete Reinforcing Steel Institute.

704.05 PROTECTION OF MATERIALS

Bars, after placement, shall be free of damage, oil, loose mill scale and loose rust. Bars with thin powdery rust, tight rust, mill scale or a combination thereof will be acceptable without cleaning provided that upon removal of all loose rust and scale by wire brushing, bars meet both minimum weight and deformation requirements. The Contractor shall bear any expense associated with cleaning, testing or replacement of damaged bars as directed by the Engineer.

704.06 PLACING AND FASTENING.

Placement and reinforcing steel shall conform to the requirements of CRSI "Recommended Practice for

Placing Reinforcing Bars" except as modified herein.

All steel reinforcement shall be accurately placed in the positions shown on the plans and firmly held during the placing and setting of concrete. Reinforcing bars in the top mat of bridge decks and sidewalks shall be tied at all intersections. Reinforcing bars in the bottom mat of bridge decks and sidewalks shall be tied at alternate intersections. Other reinforcement shall be tied at all intersections where the spacing is 9 inches or more in any direction. Where the spacing is less than 9 inches in each direction, reinforcement shall be tied at alternate intersections.

Distances from the forms and layers of bars shall be maintained by means of manufactured metal spacers, bolsters, chairs or other approved supports. Metal spacers, bolsters, or chairs which are in contact with the forms shall be galvanized, plastic coated, stainless steel or other approved material. Catalog cuts of spacers, bolsters, or chairs intended for use shall be submitted to the Engineer for approval. Blocks for holding reinforcement from contact with forms or earth shall be suitably cured precast mortar blocks of approved shape and dimensions. The use of pebbles, stone, bricks, metal pipes, wooden blocks, or other unsuitable materials will not be permitted.

Reinforcement in any member shall be inspected and approved by the Engineer before the placing of concrete begins. Ample time, as determined by the Engineer, shall be provided for the inspection of reinforcement prior to concrete placement. Concrete placed before inspection and approval of the reinforcement by the Engineer shall be cause for rejection and removal of the concrete.

Dowel bars shall be securely supported prior to the start of concrete placement and shall not be stuck into the concrete after the concrete is placed.

704.07 SPLICING

All reinforcement shall be furnished in the full lengths indicated on the plans or approved shop drawings unless otherwise permitted. Splicing of bars, except where shown on the plans or approved shop drawings, will not be permitted without approval. Splices shall be staggered as much as possible. Unless otherwise shown on the plans, bars shall be lapped 30 diameters to make the splice. In lapped splices; the bars shall be placed and wired in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans. Lapped splices shall not be used for Nos. 14 and 18 bars. Welding of reinforcing steel and other positive connections shall be used only if detailed on the plans or if authorization is made by the Engineer in writing. Welding shall conform to "Structural Welding Code - Reinforcing Steel" AWS D 1.4 and applicable special provisions. In bars required for compression only, the compressive stress may be transmitted by bearing of square cut ends held in concentric contact by a suitable device. Ends shall terminate in flat surfaces within 1-1/2 degrees of right angles to the axis of the bars and shall be fitted within 3 degrees of full bearing after assembly. End bearing splices shall not be used except in members containing closed ties, closed stirrups, or spirals.

704.08 SUBSTITUTIONS

Substitution of different size reinforcing bars will be permitted only with specific authorization by the Engineer. If a substitute is authorized, it shall have an area equivalent to the design area, or larger.

704.09 EPOXY COATED BARS

(A) CERTIFICATION. The coating applicator shall furnish to the Engineer, at the time of shipment, written certification that the coated reinforcing bars were cleaned, coated, tested, and repaired in accordance with AASHTO M 284.

(B) FABRICATION. The Contractor shall notify the Engineer of the date and location of fabrication and coating to allow inspection and testing of epoxy coated reinforcing steel before shipment to the project site.

All systems for handling coated bars shall have padded contact areas. Nylon strapping or padded bundling bands shall be used. The bars or bundles shall not be dropped or dragged.

Drive rolls on shear beds and back-up barrels on benders shall be protected with a suitable plastic covering to minimize damage during the fabrication process.

Coated bars shall be stored on wooded or padded cribbing.

The fabricator shall maintain the identity of the coated bars, and shall assure that the coated, fabricated bars are identified with proper tags for final shipment to the job site.

Repair will be required within each fabricated area of the reinforcing bar when bond loss and damage exist. When repair is required, all damage within each area shall be cleaned and repaired. The cleaning shall remove loose or deleterious material or both. In case where rust is present, it shall be removed by blast cleaning prior to repair. Repair material shall conform to AASHTO M 284.

Hairline cracks without bond loss or other damage need not be repaired.

The repairs shall be performed as soon as possible and before oxidation appears.

(C) INSTALLATION. All systems for handling coated bars shall have padded contact areas. The bars or bundles shall not be dropped or dragged. Coated bars shall be stored on wooden or padded cribbing.

Coated bars shall be tied with coated tie wire or any suitable material acceptable to the Engineer that will not damage or cut the coating.

The coated bars shall be installed on plastic coated or epoxy coated wire supports.

If wielded splices are required or permitted, suitable ventilation shall be provided.

After completion of welding on coated reinforcing bars, coating damage shall be repaired in accordance with 704.09(D). All welds, and all steel splice members when used to splice bars, shall be coated with the same material used for repair of coating damage.

When required or permitted, mechanical connections shall be installed in accordance with the splice device manufacturer's recommendations.

After installing mechanical connections on coated reinforcing bars, coating damage shall be repaired in accordance with 704.09(D). All parts of mechanical connections used on coated bars, including steel splice sleeves, bolts, and nuts shall be coated with the same material used for repair of coating damage.

Reinforcing bars partially embedded in concrete shall not be field bent, except as indicated on the

contract documents or permitted by the Engineer. When heat is used to field bend coated reinforcing bars, suitable ventilation shall be provided. When coated reinforcing bars are field bent, coating damage shall be repaired in accordance with 704.09(D).

Unless permitted by the Engineer, reinforcing bars shall not be cut in the field. When coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

(D) REPAIR. Repair material shall conform to AASHTO M 284.

Damage caused during shipment of epoxy bars or by installation procedures or both need not be repaired in cases where the damaged area is 1/4 inch by 1/4 inch or smaller and the sum of all damaged areas in each 1-foot length of bar does not exceed 2 percent of the bar surface area. All damaged areas larger than 1/4 inch square shall be repaired and all bars with total damage greater than 2 percent of bar surface area shall be rejected and removed. The total bar surface area covered by patching material shall not exceed 2 percent, including patching performed by the fabricator. All bars cut at the site shall be repaired.

(E) REJECTION. Coated bars which do not meet the requirements of this specification shall be rejected. At the Contractor's option, coated bars having defects shall be replaced or alternately, stripped of coating, recleaned and recoated in accordance with the requirements of this specification.

704.10 MEASURE AND PAYMENT

The unit of measure for Reinforcing Steel, coated or uncoated, will be the pound. The number of pounds will be the actual number of pounds of reinforcing steel complete in place as computed from bar lists and will be based on the theoretical weight per linear foot for the particular size of reinforcement used. Should the Engineer, upon request of the Contractor, permit the substitution of larger and heavier bars than are required by the plans, measurement will be made only for the sizes required by the plans. In case short bars are used when full-length bars might reasonably be provided, measurement will be made as if full-length bars were used. No allowance will be made for epoxy coating or for ties, wires, braces, clips, spacers, supports, chairs, or other similar devices used to support the reinforcement during construction.

The number of pounds of Reinforcing Steel placed, coated or uncoated, will be paid for at the contract unit price per pound, which payment will include all reinforcing steel incorporated in the concrete which is not specifically included in another item or items of the Schedule of Prices. This payment will also include all labor, plant, materials, cleaning and all other expenses necessary for furnishing and placing of steel complete in the work, including the cost of furnishing extra bars as herein specified for sampling.